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(54) A storage media for an optical information system having an identification code embedded therein.

(57) A optical storage disc for use in an optical storage system includes a storage layer which is capable of being disrupted when a laser beam of sufficient intensity is focused thereon. The optical storage disc has a transparent substrate layer on one side of the storage layer and a lacquer layer on the other side of the storage layer. The disruptions provided by the laser beam are selected to provide human readable and/or machine readable patterns. To reduce the damage to portions of the optical disc other than the storage layer, the storage layer is exposed to the laser beam prior to curing, or prior to applying and curing the lacquer layer. The optical disc can be of the type with data written thereon during fabrication, or the disc can be of the type in which data can be impressed thereon after fabrication of the optical disc. The patterns on the optical disc can be in the form of optical bar codes. In one application of the present invention involving the type of disc on which data can be written after fabrication, the pattern resulting from application of the laser beam to the disc is read by an optical reading device and transferred to the disc in the data format.

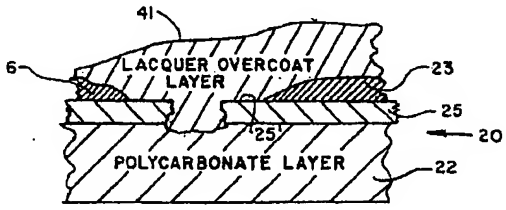

FIG. 4B

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ed without excessive damage. The markings provided by the laser beam are arranged in preselected patterns, the patterns including machine readable and human readable information. According to one embodiment, optical bar code patterns can be printed in a manner that the position of an optical bar code reader relative to the center of the disc is irrelevant in interpreting the optical bar code message.

These and other aspects, objects, features and advantages of the present invention will be more clearly understood and appreciated from a review of the following detailed description of the preferred embodiments and appended claims, and be reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a cross sectional view of an optical storage disc of the type generally referred to as a read-only optical storage disc.

Figure 2 is a cross sectional view of an optical disc of the type generally referred to as a writable optical storage disc.

Figure 3A illustrates a first embodiment of a process by which machine readable and human readable information can be indelibly fixed in the optical storage media, and Figure 3B illustrates a second embodiment of a process by which machine readable and human readable information can be indelibly fixed in an optical storage media.

Figure 4 is a cross sectional view of a mark in an optical storage disc generated as a result of the process illustrated in Figure 3A, while Figure 4B is a cross sectional view of a mark in an optical storage disc generated as a result of the process illustrated in Figure 4B.

Figure 5 illustrates an optical disc having machine readable and human readable text printed thereon.

Figure 6 illustrates how the optical bar code characters are formed according to the present invention.

Figure 7 is a block diagram of the storage medium and the read/write head including apparatus associated therewith of the storage and retrieval unit.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

1. Detailed Description of the Figures

Referring to Figure 1, a cross-sectional view of a read-only optical storage disc 10 for storing prerecorded data (in a form which can be identified by a radiation beam interacting with the disc) is shown. Transparent polycarbonate or substrate layer 12, or similar material has an optical transmission characteristic which permits the radiation interacting with the storage layer structure of the optical disc to be transmitted therethrough. The polycarbonate layer also acts as a support and protection layer for the remainder of the optical disc. Next to the polycarbonate layer 12 is the aluminum reflector layer 11. The polycarbonate layer 12 is fabricated with the stored information as a surface structure. The reflecting layer is deposited in such a manner as to provide a surface generally retaining the structure of the polycarbonate surface. A lacquer or other protective overcoat layer 13 is applied to the aluminum reflector layer in an uncured state. The lacquer or protective layer is typically of the type which is cured by ultraviolet radiation and the cured lacquer layer 13 supports and protects the aluminum reflector layer 11. In the past, identification markings 14 have been typically printed on the surface of the lacquer overcoat layer 13 or mechanically scribed in the surface of lacquer overcoat layer 13.

Referring to Figure 2, a writable optical storage disc 20 used for the storage of information is shown. In this type of optical storage disc, the data can be 'written' on the disc after the disc is fabricated. As with the optical storage disc of Figure 1, the writable optical disc includes a polycarbonate substrate of support layer 22. The storage layer 5 of the disc consists of a recording layer 21, which can be a dye polymer layer, and reflector layer 25, which can be fabricated from gold. Next to the reflector layer 25 is a lacquer overcoat layer 23, which is applied and then cured. Finally, the markings 24 on the surface of the disc provide human and machine readable information.

Referring to Figure 3A, the process for providing indelible information on a disc is shown. In step 31, the several layers of the optical disc is assembled. In step 32, the storage layer and the reflecting layer of the optical disc has information applied thereto, typically by using laser radiation to disrupt an interior surface region. In step 33, the lacquer overcoat layer is cured, providing the final step in the fabrication of an optical disc according to the present invention. In Figure 3B, an alternative process for providing indelible information on an optical disc is shown. In step 35, several layers of the optical disc are assembled. However, the surface region of the storage layer and reflective layer, on which the writing is to be inscribed, does not have the lacquer or protective coating applied thereon. In step 36, the marking of the surface is accomplished. In the preferred embodiment, this marking is accomplished by focused high intensity radiation, such as focused laser radiation. In step 37, the newly applied protective overcoat is applied to the region which has been marked and, if required, the protective coating is cured.

Referring to Figure 4A, a phenomenalogical representation of an identifying mark on an optical disc, capable of having information written thereon after fabrication, is shown. The disc 20 is fabricated with a polycarbonate layer 22, a reflecting layer 25, and a lacquer overcoat layer 23. The disruption 4 caused by

the lacquer overcoat layer, when present remains pliable enough to absorb damage that would otherwise result from the disruption of the polycarbonate layer.

In the optical disc capable of having information written or stored thereon after fabrication, the present invention has an important application. A facility capable of only reading the optical disc would typically not have the apparatus to interpret the optical bar code. Without the ability of read and interpret the bar code automatically, information can be stored on the disc which is not appropriate for that disc. Therefore, at the facility where the data is added to the fabricated disc, an optical bar code reader can be used to identify the optical bar code information and to include the information automatically in the data written or stored on the disc. In other words, the simultaneous presence of bar coded encoded information and equivalent information stored in the format of the information written on the optical disc insures that the disc has not been compromised.

While the storage medium has been described both in general terms and in terms of an optical disc, other medium for the storage of optical information, which have the general layer structure of the optical disc, can use the present invention advantageously. In addition, the storage layer has been described as generally including a reflective layer. The use of the reflection of radiation from a storage disc is generally used to identify the information stored thereon. However, the use of an optical storage disc which relies on the interaction of transmitted radiation with the storage media could use the present invention advantageously.

Similarly, while the invention has been described with particular reference to a preferred embodiment, it will be understood by those skilled in the art that various changes may be made and equivalents may be substituted for elements of the preferred embodiment without departing from invention. In addition, many modifications may be made to adapt a particular situation and material to a teaching of the invention without departing from the essential teachings of the present invention. By way of specific example, the lacquer layer used proximate the storage layer could be implemented with any material having properties suitable for the protection of the storage layer. By way of a different example, in the erasable optical disc, the storage layer can be selected of a material wherein an impinging radiation beam this appropriate parameters can provide a non-reversible change can take place. The non-reversible change protected from compromise by the protective overcoat layer.

As is evident from the foregoing description, certain aspects of the invention are not limited to the particular details of the examples illustrated, and it is therefore contemplated that other modifications and applications will occur to those skilled in the art. It is accordingly intended that the claims shall cover all such modifications and applications as do not depart from the true spirit and scope of the invention.

Claims

1. A optical storage disc capable of having identifiable marking stored thereon, said markings resulting from an interaction of a laser beam with said optical storage disc, said optical storage disc comprising:

   a support substrate layer, said support substrate layer being transparent;

   a storage layer proximate said support substrate layer and capable of having data stored thereon, said storage layer having a preselected pattern of disruptions in a selected region resulting from irradiation by said laser beam;

   a protective layer covering said proximate said storage layer.

2. The optical storage disc of Claim 1 wherein said protective layer is applied prior to fabrication of said preselected pattern of disruptions, said protective layer being cured after fabrication of said preselected pattern of disruptions.

3. The optical storage disc of Claim 1 wherein said protective layer is applied to said selected region after fabrication of said preselected pattern of disruptions.

4. The optical storage disc of Claim 3 wherein said pattern of disruptions in said storage layer can be human readable or machine readable.

5. The optical disc of Claim 3 wherein said pattern of disruptions can be read by an optical bar code reader.

6. The optical storage disc of Claim 5 wherein said pattern of disruptions is structured such that a position of said optical bar code reader with respect to said field is independent of radial position.

7. The optical storage disc of Claim 3 wherein said storage disc is selected from the group of optical discs comprised of write-once optical discs, writable optical discs and erasable optical discs data identified by said pattern of disruptions being written on a mirror region of said optical disc.

8. The optical storage disc of Claim 3 wherein said storage layer includes a dye polymer layer.

9. The optical storage disc of Claim 1 wherein said pattern of disruptions includes information with

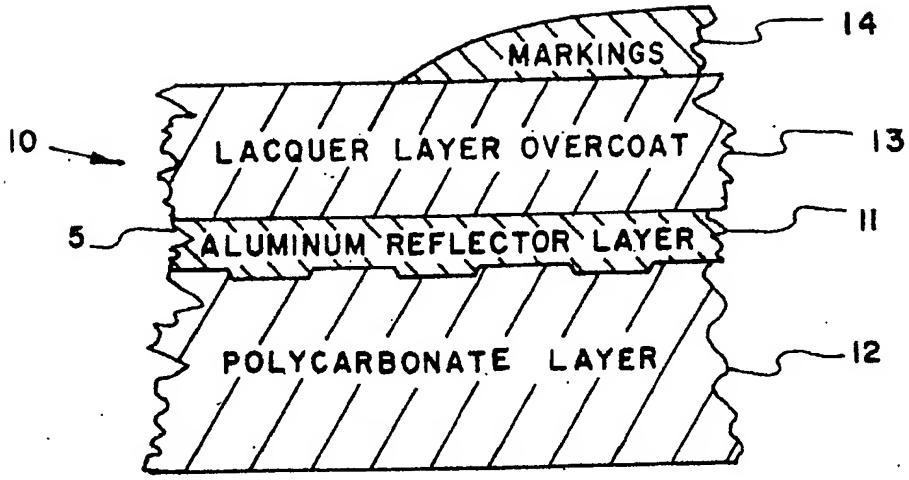
14
MARKINGS
10
LACQUER LAYER OVERCOAT
13
5
ALUMINUM REFLECTOR LAYER
11
POLYCARBONATE LAYER
12

FIG. 1

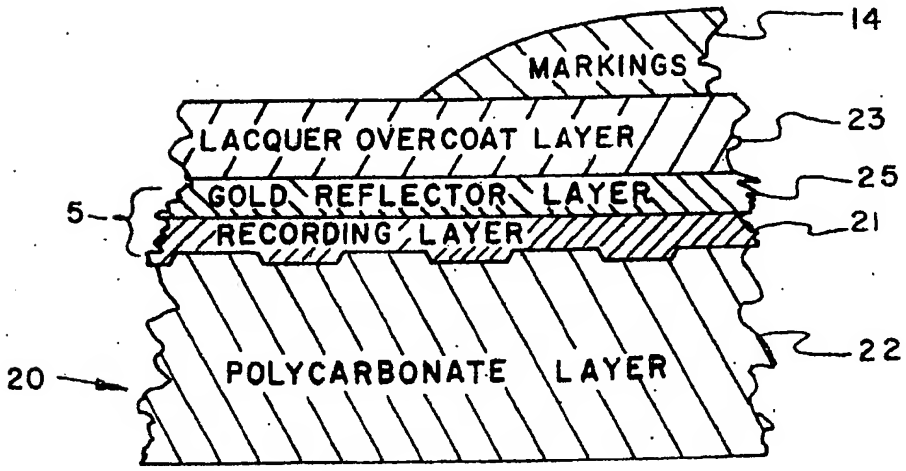
14
MARKINGS
LACQUER OVERCOAT LAYER
23
25
5
GOLD REFLECTOR LAYER
RECORDING LAYER
21
22
20
POLYCARBONATE LAYER

FIG. 2

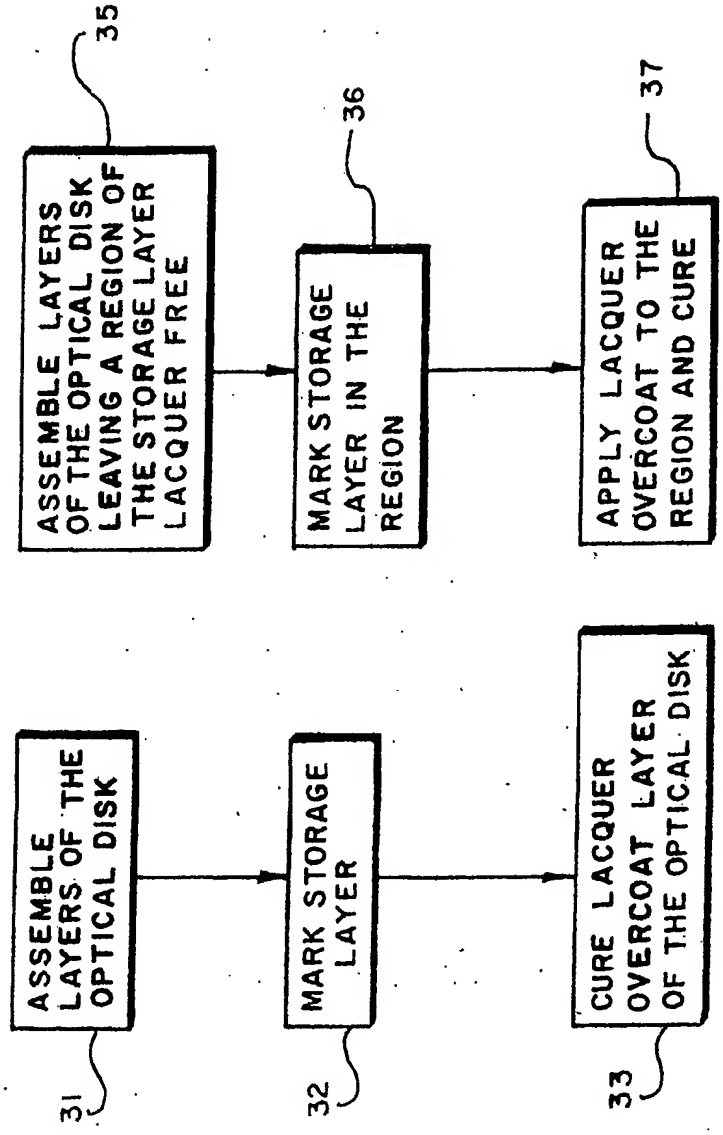
ASSEMBLE LAYERS OF THE OPTICAL DISK
MARK STORAGE LAYER
CURE LACQUER OVERCOAT LAYER OF THE OPTICAL DISK
31
32
33

FIG. 3A

ASSEMBLE LAYERS OF THE OPTICAL DISK LEAVING A REGION OF THE STORAGE LAYER LACQUER FREE
MARK STORAGE LAYER IN THE REGION
APPLY LACQUER OVERCOAT TO THE REGION AND CURE
35
36
37

FIG. 3B

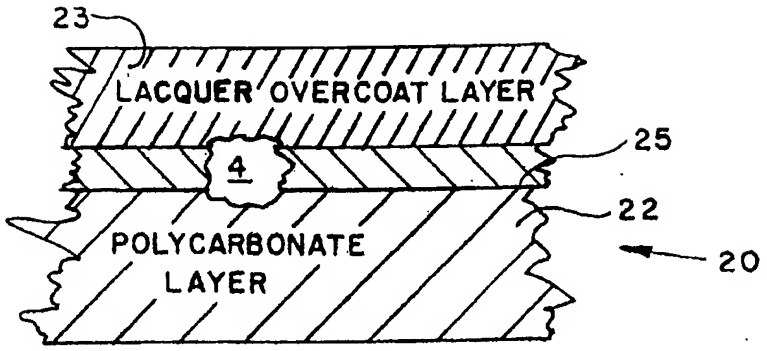

FIG. 4A

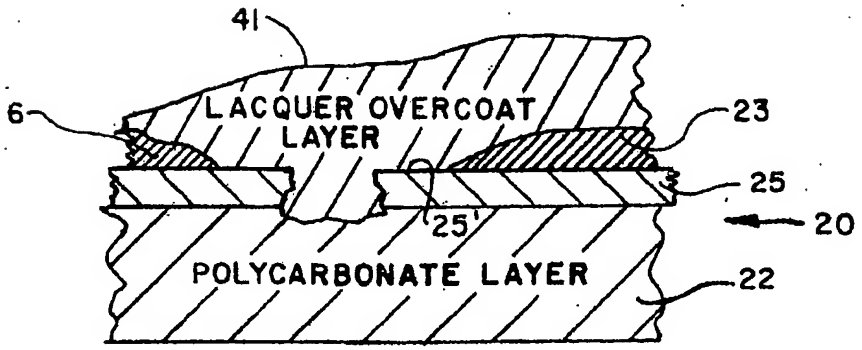

FIG. 4B

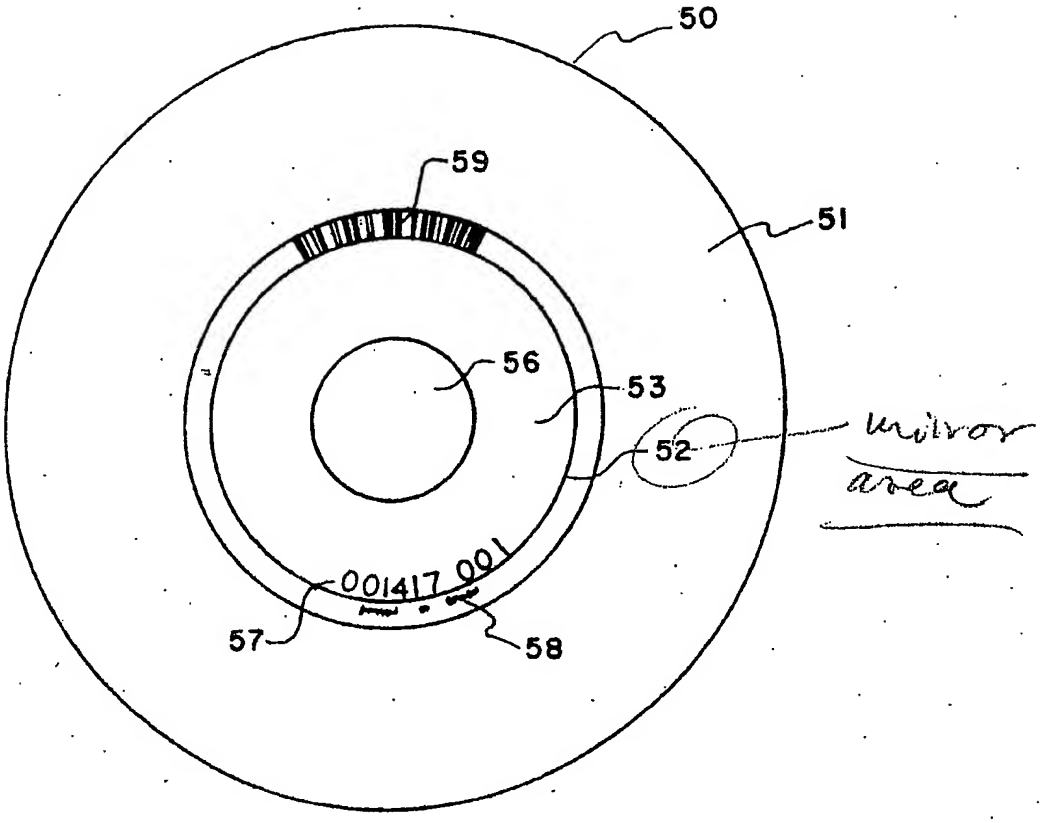

FIG. 5

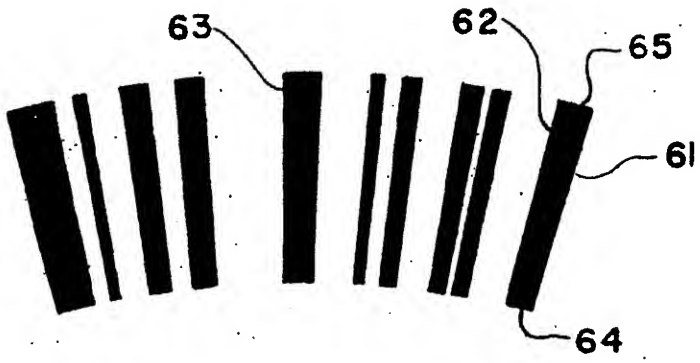

FIG. 6

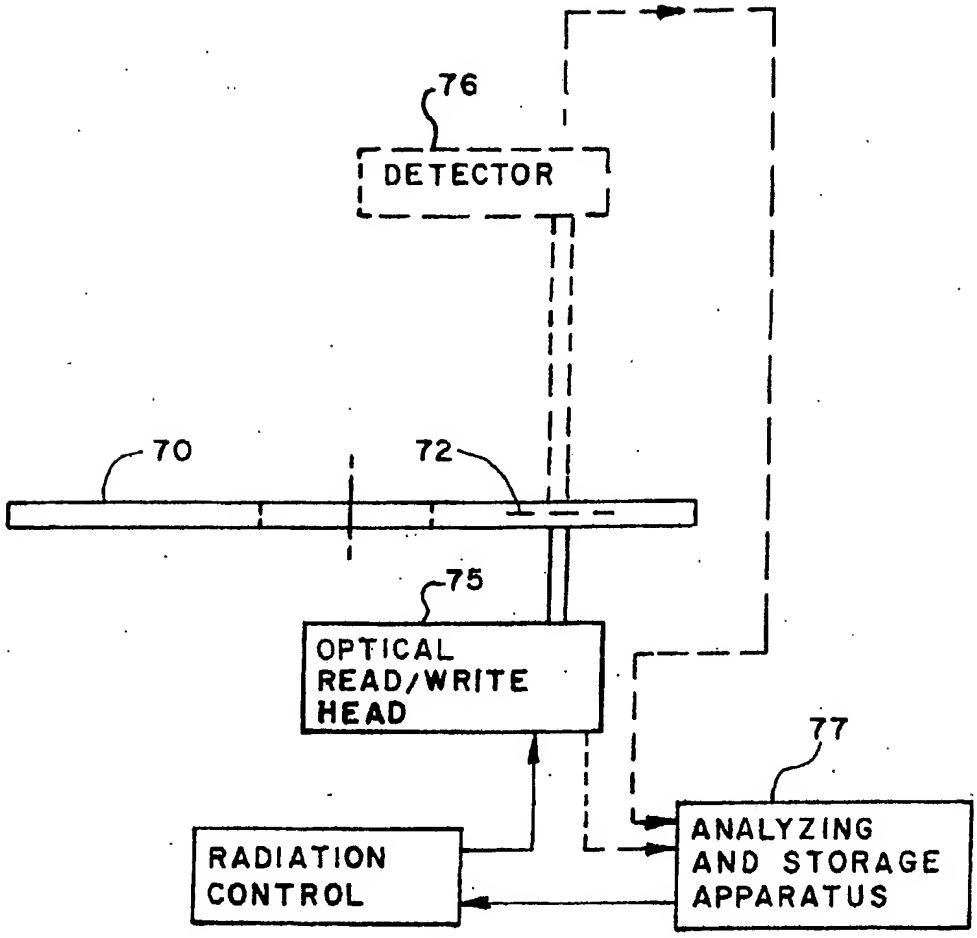
76
DETECTOR
70
72
75
OPTICAL
READ/WRITE
HEAD
77
RADIATION
CONTROL
ANALYZING
AND STORAGE
APPARATUS

FIG. 7

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